# Maternal perinatal risk factors for adolescent mood disorders in an inpatient setting

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## Declaration

By submitting this thesis, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

This dissertation includes an extended literature review and a publication-ready manuscript. The development and writing of the papers (unpublished) were the principal responsibility of myself and, for each of the cases where this is not the case, a declaration is included in the dissertation indicating the nature and extent of the contributions of co-authors.

Signed:

Date: 04 January 2021

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## Introduction

The period of adolescence, between the ages of 12 – 18 years, has been recognized as a vulnerable period for the development of mental illness. Most adulthood mental disorders are known to begin in childhood and adolescence (Kessler et al. 2007). There is relatively little information regarding the mental health status of adolescents in low- to middle-income countries (LMICs), including South Africa, and there have been urgent calls to address this (Patel et al. 2013). As a first step, there is a need to understand the possible risk factors that might be associated with the development and progression of mental disorders in youth.

One of the major factors known to affect the psychological wellness of youth is the mental health of caregivers (Santos et al. 2014). Numerous studies have shown that a parental history of depression or anxiety is a significant risk factor for the development of psychiatric disorders during childhood or adolescence (Herman et al., 2009; Lieb et al., 2002; Phillips et al., 2005; Weissman et al., 2010). Weisman et al. (2006) showed that there is adolescent onset of depression in offspring of depressed parents. Furthermore, these individuals have recurrences leading to major depression and poor outcomes as they grow into adulthood. Dougherty et al. (2011) explored the relationship between parents' lifetime history of depression and their offspring's cortisol reactivity to a psychosocial stressor and found it to be a reason for the development of depression in the offspring of depressed parents.

Women/mothers are typically the primary caregivers in the South African population, and a growing body of literature has demonstrated a positive relationship between maternal mental disorders and poor child and adolescent outcomes (Herman et al., 2009; Lieb et al., 2002; Phillips et al., 2005; Weissman et al., 2010). There are several social and environmental stressors or risk factors that may further contribute to adolescent and/or maternal mental health disorders, particularly in the South African context. These include high rates of poverty, teenage

pregnancy, abuse and trauma, and substance use. The way in which these factors might contribute to the development of adolescent mental health disorders in the local context has not yet been described. Therefore, this research aims to describe the pattern of maternal mood disorders and substance use in adolescents with mood disorders. This information will be helpful to understand the patterns and personal histories of adolescents that may be contributing to their current presentations as either perpetuating or precipitating factors.

## Literature review

Adolescence is characterized as a period of intensive physical, social and emotional development between the ages of 12 - 18 years old (Dahl 2004). It has been shown to be a particularly vulnerable period for the development of mental illness, which could have long-lasting effects throughout life and severe implications for adult development and health (Kieling et al. 2011). According to Kessler et al. (2007), most adulthood mental disorders begin in childhood and adolescence. In the United States of America, it is estimated that about 20% of children and adolescents have a mental health disorder (Kessler et al. 2005), and the prevalence of depression in adolescents ranges from 4% to 8% (Costello et al. 2006).

Most available literature on adolescent mental health originates from high income countries, and relatively little epidemiological data exists for the prevalence of adolescent mental health disorders in low- to middle-income countries (LMICs), including South Africa (Patel et al. 2013). However, a study by Cheng et al. (2014), which examined the mental health of adolescents aged 15 – 19 years old in five cities around the world, including Baltimore, New Delhi, Ibadan, Johannesburg and Shanghai, found the highest levels of depression (45%) and posttraumatic stress symptoms (67%) among female adolescents in Johannesburg. Although comprehensive prevalence estimates are not available in South Africa, the study by Cheng et

al. (2014) highlights the potentially very high burden of disease among South African youth, which could have important public health impacts.

Mental illness in adolescents has been found to be associated with significant disease burden, including poor academic achievement, suicide, violence, substance use, pregnancy and increased risk of psychopathology later in adulthood (Patel et al. 2007; Hawton et al. 2012; Belfer 2008). Unfortunately, the majority of South African adolescents with mental illness remain undiagnosed and untreated, and services are often fragmented (Paruk and Karim 2016). There has been an urgent call to action to address the burden of mental health problems in adolescents globally, particularly in LMICs (Patel et al. 2013).

As a first step, there is a need to understand the possible risk factors that might be associated with the development and progression of mental disorders in youth. One of the major factors known to affect the psychological wellness of youth is the mental health of their caregivers (Santos et al. 2014). Numerous studies have shown that a parental history of depression or anxiety is a significant risk factor for the development of psychiatric disorders during childhood or adolescence (Herman et al., 2009; Lieb et al., 2002; Phillips et al., 2005; Weissman et al., 2010). Weisman et al. (2006) showed adolescent onset of depression in offspring of depressed parents. Furthermore, these individuals have recurrences leading to major depression and poor outcomes as they grow into adulthood. Dougherty et al. (2011) explored the relationship between parents' lifetime history of depression and their offspring's cortisol reactivity to a psychosocial stressor and found it to be a reason for the development of depression in the offspring of depressed parents.

Women/mothers are typically the primary caregivers in the South African population. A growing body of literature has demonstrated a positive relationship between perinatal

depression and poor infant outcomes. Many women may start experiencing psychiatric symptoms, particularly mood disorders, for the first-time during pregnancy and some of these symptoms persist in the post-partum period and beyond, often requiring lifelong management (Verbeeketal, 2012; Weissman et al., 1997). These mood symptoms during pregnancy and symptoms persisting three months postpartum are considered risk factors for long term effects on the mental health of children (Brummelte and Galea, 2010). Other studies have shown that maternal depression is associated with an increased risk of emotional and behavioural problems in children, and a delay in cognitive development and infant growth (Avan et al. 2010). A longitudinal, community-based study assessed antenatal depression as a predictor for depression in adolescent offspring (Hans et al., 2013). Findings showed that all 16-year-old adolescents with depression had been exposed to maternal depression at some point in their lives. These researchers further noted that the offspring exposed to maternal depression during the perinatal period were four times more likely than those not exposed during this period to develop depression in adolescence. Overall, these findings highlight that maternal mental illness may also be an important predictor for the development of mental illness in adolescents.

There are a number of social and environmental stressors or risk factors that may further contribute to adolescent and/or maternal mental disorders, particularly in the South African context. One leading factor relates to poverty or an individual's socioeconomic status. Psychiatric disorders feature in higher frequency in families with lower incomes (Micali et al. 2014). Poverty is also associated with a higher prevalence of teenage pregnancy and parenthood (Shaw et al. 2006), and there is evidence that teenage mothers are more likely to experience depression during the perinatal period (Quinlivan et al. 2004). Fergusson and Woodward (1999) investigated the relationship between maternal age at birth and outcomes at age 18 in a New Zealand cohort and found that younger maternal age was associated with educational under-achievement, juvenile crime, substance misuse, and mental health problems. Another

risk factor is a history of trauma and abuse. There is a high prevalence of childhood and women abuse in South Africa (Seedat et al. 2005; Williams et al. 2007). Childhood abuse during early childhood is associated with increased risk of depression in adolescents (Consoli et al., 2013), as well as increased suicide risk, substance use, risky sexual behaviour and school dropout (Cunningham et al. 1994; Hawkins et al. 1992).

Another factor relates to maternal substance use, since comorbid substance use disorders and mental illnesses such as depression are common (Carrà et al., 2015). Substance use disorders have been identified as the second most prevalent lifetime disorder in South Africa (13.3%) (Pluddemann et al., 2004). Overall, high prevalence rates of substance abuse adds to the complex picture of maternal perinatal risk factors amongst women in South Africa (van Heerdan et al. 2009). Mothers who are physically and mentally dependent on alcohol and unlawful medications are in danger for an extensive variety of child rearing shortfalls starting when their children are infants and proceeding as their child develops through school-age and pre-adult years (Harker et al., 2010). Maternal substance abuse may prompt family stress and conflict, in particular between the parents and their adolescent children (Kettinger et al. 2000).

## Rationale

This literature review has demonstrated that certain maternal mental health factors are associated with an increased risk of psychological and developmental problems in adolescents. Other environmental or social factors may exacerbate the problem. South Africa is characterized by a high prevalence of mental illness, especially among women of reproductive age, and severe socio-economic stressors, but the relationship between these factors and the mental health of adolescents is not yet clear. As a first step toward understanding this, there is a need to provide a profile of adolescents and their mothers, and specifically the prevalence of mood disorders, in these dyads. This information will be helpful to understand the patterns and

personal histories of the adolescents that may be contributing to their current presentations as either perpetuating or precipitating factors. Furthermore, knowledge about certain risk factors that may contribute to the development of intervention and treatment strategies that serve to combat the detrimental and often long-lasting effects of mental illness during youth. Findings could also contribute to prevention/awareness campaigns that aim to minimize risk factors and promote help-seeking behaviour amongst mothers.

## Publication-ready manuscript

The following manuscript has been prepared for submission to Pan African Medical Journal. The journal's aims and scope, as well as author guidelines are given in Appendix A.

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# Abstract

## Background

One of the major factors known to affect the psychological wellbeing of youth is the mental health of their caregivers. Women/mothers are typically the primary caregivers in South Africa. Previous studies have highlighted a positive relationship between maternal mental disorders and poor adolescent outcomes. This study aimed to identify the possible risk factors that are associated with the development and progression of mood disorders in an adolescent population from the Western Cape, South Africa.

## Methods

This descriptive study involved a retrospective record review of all patients admitted to Tygerberg adolescent psychiatric inpatient unit during the period 2015 to 2017. The study sample consisted of 10 male and 27 female research participants. Continuous variables were summarized as mean and standard deviation, while nominal variables were summarized as counts and percentages.

## Results

The research findings identified a number of possible maternal risk factors associated with the development of adolescent mood disorders. These risk factors include a history of maternal psychiatric illness, maternal postpartum depression, domestic violence, adolescent bereavement and maternal substance use during and after pregnancy.

## Conclusion

Mothers with a history of psychiatric disorders need further psycho-education regarding the possible impact of these risk factors on the mental health of their children.


Keywords: mood disorders, adolescents, maternal, risk factors

## Introduction

The period of adolescence, between the ages of 13-18 years, has been recognized as a vulnerable period for the development of mental illness. Most adulthood mental disorders are known to begin in childhood and adolescence [1]. There is relatively little information regarding the mental health status of adolescents in low- to middle-income countries (LMICs), including South Africa, and there have been urgent calls to address this [2]. As a first step, there is a need to understand the possible risk factors that might be associated with the development and progression of mental disorders in youth.

One of the major factors known to affect the psychological wellness of youth is the mental health of caregivers [3]. Numerous studies have shown that a parental history of depression or anxiety is a significant risk factor for the development of psychiatric disorders during childhood or adolescence [4–7]. Weisman et al. [8] showed that there is adolescent onset of depression in offspring of depressed parents. Furthermore, these individuals have recurrences leading to major depression and poor outcomes as they grow into adulthood. Dougherty et al. [9] explored the relationship between parents' lifetime history of depression and their offspring's cortisol reactivity to a psychosocial stressor and found it to be a reason for the development of depression in the offspring of depressed parents.

Women/mothers are typically the primary caregivers in the South African population, and a growing body of literature has demonstrated a positive relationship between maternal mental disorders and poor child and adolescent outcomes [4–7]. There are several social and environmental stressors or risk factors that may further contribute to adolescent and/or maternal mental health disorders, particularly in the South African context. These include high rates of poverty, teenage pregnancy, abuse and trauma, and substance use. The way in which these factors might contribute to the development of adolescent mental health disorders in the local context has not yet been described. Therefore, this research aims to describe the pattern of maternal mood disorders and substance use in adolescents with mood disorders. This information will be helpful to understand the patterns and personal histories of adolescents that may be contributing to their current presentations as either perpetuating or precipitating factors. The study of mothers and infants showed that maternal psychopathology is linked to a higher risk of attachment problems. Regardless of age, the offspring of mothers with mood and anxiety disorders are at a greater risk for all mental health disorders.

# Methods

## Study design

This descriptive study involved a retrospective record review of all patients admitted to Tygerberg Hospital's Adolescent Psychiatry Inpatient Unit during the period 2015 to 2017. The study focused on those patients who presented with mood disorders during their admission into the unit. Relevant data was collected from patient files and reviewed for maternal patterns of mood disorders and substance use. The maternal data was derived from the adolescent patients' clinical records, and the mothers referred to in the data were the patients' primary caregivers.

## Study site

Tygerberg Hospital provides the only adolescent inpatient unit for mentally ill youths in a medical tertiary level hospital in the Western Cape. It caters for adolescents (age 13-18 years) that require specialized psychiatric assessment and intervention. The unit opened in 2013 and has 16 beds with a multidisciplinary team that consists of a psychiatrist, clinical psychologist, social worker, occupational therapist, and nursing staff.

## Study procedure

Patient records were requested and retrieved via Clinicom at Tygerberg Hospital. All patient data was extracted by the principal investigator and collated in a Microsoft Excel spreadsheet. Records were limited to adolescents (age 13-18 years) who presented to the unit between 2015 and 2017 with mood disorders, diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders, 5$^{th}$ Edition (DSM-5) [10]. Mood disorders include bipolar disorder, major depressive disorder, adjustment disorder with depressed mood, and mood disorder due to substance use. Patients were classified as adolescents if they were aged 13 years or older. Individuals who were18 years old and still attending school were included. Patients who did not meet the criteria for mood disorder, or who meet the criteria for more severe psychiatric illness such as schizophrenia or any other purely psychotic disorders were excluded.

## Statistical analysis

Continuous variables were summarized as mean and standard deviation, while nominal variables were summarized as counts and percentages. Since this is a descriptive study, no further analytical/statistical methods were employed.

### Ethical considerations

Approval to conduct this research was granted by the Human Research Ethics Committee of Stellenbosch University (Ethics no #S18/09/193). A waiver of informed consent was granted for the retrospective nature of the review. Approval to access patient folders was also granted by the Research committee from Tygerberg Hospital Management. All data was anonymised to ensure privacy and confidentiality of participants' personal information, with each participant assigned a unique identifier.

## Results

Three hundred and fifteen patient files were available for chart review, of which 165 were excluded due to patients treated as outpatients and/or admitted outside of the study period (2013 - 2018). Of the remaining 150 files suitable for inclusion in this study, a further 113 were excluded as these patients had previously been treated for Schizophrenia or Eating Disorders and/or were over the age of 18 years, resulting in a final sample set of 37 records.

The study sample consisted of 10 male and 27 female research participants. The demographic characteristics of the sample are summarised in Table 1. A majority of participants identified themselves as mixed race (78.4%) and attending school (91.9%), most of whom were in secondary school (75.7%).

**Table 1: Demographic characteristics of adolescents (N=37).**

| Variables | N | % |
|---|---|---|
| **Gender** | | |
| Female | 27 | 73.0 |
| Male | 10 | 27.0 |
| **School attendance** | | |
| Attending school | 34 | 91.9 |
| Not attending school | 3 | 8.1 |
| **Highest level of education** | | |
| Primary (Grades 1-7) | 3 | 8.1 |
| Secondary (Grades 8-11) | 28 | 75.7 |
| Matric (Grade 12) | 5 | 13.5 |
| Tertiary | 1 | 2.7 |

The clinical history of the adolescents is summarised in Table 2. Over half of cases (51.4%) had a first presentation. Trauma was experienced by19% of participants in this study while , 27% had a history of substance use and 45.9% experienced bereavement..

**Table 2: Clinical and psychosocial history of adolescents (N=37).**

| Variables | N | % |
|---|---|---|
| **First presentation** | | |
| Yes | 18 | 51.4 |
| No | 19 | 48.6 |
| **Epilepsy** | | |
| Yes | 4 | 10.8 |

| | | |
|---|---|---|
| No | 33 | 89.2 |
| **Forensic history** | | |
| Yes | 1 | 2.7 |
| No | 36 | 97.3 |
| **History of Trauma** | | |
| Yes | 8 | 21.6 |
| No | 29 | 78.4 |
| **History of substance use** | | |
| Yes | 10 | 27.0 |
| No | 27 | 73.0 |
| **Bereavement** | | |
| Yes | 17 | 45.9 |
| No | 20 | 54.1 |

Table 3 presents psychiatric diagnoses of adolescents during admission as well as upon discharge. Of the adolescents admitted to the unit, 45.9% were diagnosed with Major Depressive Disorder and 35.1% had Bipolar Disorder (Table 3). At discharge, 64.9% of participants were diagnosed with Major Depressive Disorder while the rate of Bipolar Disorder remained the same.

**Table 3: Psychiatric diagnoses of adolescents (N=37).**

| **Admission diagnosis** | **N** | % |
|---|---|---|
| **Major Depressive Disorder** | | |
| Yes | 17 | 45.9 |
| No | 18 | 48.6 |
| **Bipolar disorder** | | |
| Yes | 13 | 35.1 |
| No | 24 | 64.9 |
| **Adjustment disorder** | | |
| No | 37 | 100 |
| **Suicide attempt** | | |
| Yes | 3 | 8.1 |
| No | 34 | 91.9 |
| **Self-harm** | | |
| Yes | 3 | 8.1 |
| No | 34 | 91.9 |
| **Discharge diagnosis** | | |
| **Major Depressive Disorder** | | |
| Yes | 24 | 64.9 |
| No | 13 | 35.1 |
| **Bipolar disorder** | | |
| Yes | 13 | 35.1 |
| No | 24 | 64.9 |
| **Adjustment disorder** | | |
| No | 37 | 100 |
| **Suicide attempt** | | |
| **No** | 37 | 100 |
| **Self-harm** | | |
| **No** | 37 | 100 |

The demographic and clinical characteristics of the mothers of the adolescents included in this study are summarised in Table 4, where 43.2% of the mothers were married, 32.1% had secondary school as their highest level of education, and 56.8% had planned pregnancies. Almost half of the mothers had used substances during their pregnancy (45.9%) and had a history of psychiatric illness (48.6%). Almost one-third (27%) of mothers experienced domestic violence, while 64.9% reported to have a good bonding relationship with their child.

**Table 4: Demographic and clinical characteristics of mothers (N=xx).**

| **Variables** | **N** | **%** |
|---|---|---|
| **Marital Status** | 37 | |
| Single | 19 | 51.4 |
| Married | 16 | 43.2 |
| Divorced | 1 | 2.7 |
| Widowed | 1 | 2.7 |
| **Education Level** | 32 | |
| Primary (Grades 1-7) | 5 | 13.5 |
| Secondary (Grades 8-11) | 12 | 32.4 |
| Matric (Grade 12) | 7 | 18.9 |
| Tertiary | 8 | 21.6 |
| **Employment** | 36 | |
| Yes | 18 | 48.6 |
| No | 18 | 48.6 |
| **Pregnancy** | 33 | |
| Unplanned | 12 | 32.4 |
| Planned | 21 | 56.8 |
| **Maternal history during and after pregnancy** | | |
| **Substance use during pregnancy** | 34 | |
| Yes | 17 | 45.9 |
| No | 17 | 45.9 |
| **Depression** | 32 | |
| Yes | 15 | 40.5 |
| No | 17 | 45.9 |
| **Domestic violence** | 32 | |
| Yes | 10 | 27.0 |
| No | 22 | 59.5 |
| **Post-partum depression** | 31 | |
| Yes | 13 | 35.1 |
| No | 18 | 48.6 |
| **Mood changes** | 30 | |
| Yes | 17 | 45.9 |
| No | 13 | 35.1 |
| **Substance use** | 34 | |
| Yes | 13 | 35.1 |
| No | 21 | 56.8 |
| **Attachment reported** | 32 | |
| Not good | 8 | 21.6 |
| Good | 24 | 64.9 |
| **Positive psychiatric history** | 36 | |
| Yes | 18 | 48.6 |
| No | 18 | 48.6 |
| **HIV** | 37 | |
| Negative | 28 | 75.7 |
| Positive | 9 | 24.3 |

## Discussion

This study aimed to identify the possible risk factors that are associated with the development and progression of mental health disorders in a LMIC, with a specific focus on an adolescent population in the Western Cape, South Africa.

Psychiatric disorders are known to be familial [11], with adolescents whose parents have a history of psychiatric disorders at higher risk of internalizing these problems, such as major depression, anxiety disorders, substance dependence, and suicide attempts [12]. A parental history of depression or anxiety has been associated with the development of psychiatric illness in childhood and adolescence [4–7]. Nearly half of the mothers included in this study reported a history of a psychiatric illness. These findings therefore suggest maternal psychiatric illness as a possible risk factor for the development of psychiatric illness in the current sample of adolescent inpatients.

Postpartum depression in women often goes unrecognized. Severe and persistent postpartum depression has been shown to be detrimental to children and adolescents [13]. Postpartum depression is associated with a delay in cognitive and language development among children and higher rates of behavioural problems, disorganization, insecurity, lower grades, and depression in both children and adolescents [14]. With more than a third of mothers having experienced postpartum depression, the current findings appear to reflect a similar association as noted in the literature identifying maternal postpartum depression as a possible risk factor for the development of psychiatric illness.

Domestic violence has numerous short and long-term implications on adolescents who witness it in the home, including depression, anxiety, nightmares, teen dating violence, and failure at school [15]. Psychological effects of domestic violence impact adolescents even if they do not see it, merely hearing it is enough [16]. Witnessing domestic violence against women/mothers during childhood has been associated with high depression levels among adolescent girls [17]. With almost a third of mothers in this study reporting a prevalence of domestic violence it may also be noted as a possible risk factor for adolescent psychopathology.

Nearly half of the adolescents in the present sample had undergone bereavement that was unrelated to their primary caregiver's mental health problems, highlighting it as a possible risk factor for adolescent psychiatric illness. According to Mikulincer and Shaver [18], the death of a family member has severe mental health implications for adolescents. Death is tragic,

irreversible, and most often leads to elevated levels of psychological distress [18]. Most bereaved adolescents display irritability, anger, acute grief reactions, and lower self-esteem [18]. Responses to grief may be normal but require closer investigation since, according to Mikulincer and Shaver [18], 45.9% of teenagers go on to develop psychiatric disorders, especially depression, after the death of a loved one. This trend was not found in mothers of adolescent participants.

Maternal substance use was noted both during (45.9%) and after (35.1%) pregnancy. According to the literature there are a wide range of risk factors associated with maternal substance use, where it has been shown to have a profound negative effect on the lives of parents and children even in cases where only the mother is abusing substances [19]. Individuals with Substance Use Disorders are often unable to meet their obligations, spend a substantial amount of time recovering from intoxication and associated complications and generally have poor health [19]. Furthermore, maternal substance use can also lead to children developing similar behaviours in the early stages of life, thus scarring them during a crucial developmental period [19]. While not all children living with a parent that abuses substances will face neglect or abuse themselves, it does increase the risk for maltreatment and having a negative impact on child welfare [19]. Maternal substance has also been associated with poorer academic performance, stress, anxiety, and overall poorer wellbeing than in children whose mothers do not present with substance use disorders [19].

A significant limitation of this study is the relatively small sample size and the retrospective nature of the collection, which may lead to bias or under reporting. The small sample size limited the further statistical analyses to determine association or relationships. It is therefore recommended that future research collect data from larger sample sizes in various regions across South Africa to establish a more representative trend and possibly help develop greater insights into the associations between maternal risk factors and adolescent mood disorders.

**Conclusion**

This study identified several possible maternal risk factors associated with the development of adolescent mood disorders. These risk factors include a history of maternal psychiatric illness, maternal postpartum depression, domestic violence, adolescent bereavement and maternal substance use during and after pregnancy. These findings are similar to trends noted in the literature regarding risk factors associated with adolescent psychopathology. Parents with a history of psychiatric disorders need further psychoeducation regarding the possible impact of

these risk factors on the mental health of their children. This could provide more support for the need to implement interventions and awareness of the long-term impacts of peripartum risky behaviours and environmental stressors. Family bereavement can make adolescents internalize mental health problems and this study demonstrates the possibility of adolescents exhibiting mental health disorders after such traumatic events. Local predictors of adolescent disorders should be further researched to identify the opportunities for prevention after the occurrence of a family bereavement in adolescents.

Given the high prevalence of adverse conditions in these patients' maternal backgrounds, a case may be made for more antenatal mental health services as an increased risk of mental and behavioural disorders in children and adolescent is linked to maternal antenatal stress. To improve infant mental health, efforts to alleviate maternal antenatal stress should be prioritized. It may therefore be recommended to include gender-based violence prevention and drug use reduction programs, as well as parenting support and psychoeducation in antenatal mental health care for mothers and other caregivers.

## Recommendations

Although interesting, these findings need to be confirmed in a larger sample size to understand order of causality order Heritability as a predisposing factor in adolescent mood disorders should also be included in future research on this subject.

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## Conflict of interest

The authors declare that they have no competing interests.

## Author contributions

NLN collected the data and wrote the manuscript. AL co-conceived the study and co-supervised the project. ASA provided assistance with writing and technical editing. All authors provided critical feedback and contributed to the final version of the manuscript.

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# Appendix A – Journal guidelines

1. General

**Aim:** The PAMJ Clinical Medicine was created to highlight the rich output of clinical practice across Africa. **Scope:** We publish clinical case reports, case series, images, reviews, commentary, opinions and research articles from the broad spectrum of clinical medicine and clinical research.

PAMJ is an online open access peer-reviewed journal focusing on clinical medicine. Authors are encouraged to submit original research, systematic review and short reports from the field of clinical medicine.
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***What is already known on this topic*:** include a maximum of 03 bullet points on what is already known on this topic.

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**Acknowledgements** - Please acknowledge anyone who contributed towards the study by making substantial contributions to conception, design, acquisition of data, or analysis and interpretation of data, or who was involved in drafting the manuscript or revising it critically for important intellectual content, but who does not meet the criteria for authorship. Please also include their source(s) of funding. Please also acknowledge anyone who contributed materials essential for the study. The role of a medical writer must be included in the acknowledgements section, including their source(s) of funding. Authors should obtain permission to acknowledge from all those mentioned in the Acknowledgements. Please list the source(s) of funding for the study, for each author, and for the manuscript preparation in the acknowledgements section. Authors must describe the role of the funding body, if any, in study design; in the collection, analysis, and interpretation of data; in the writing of the manuscript; and in the decision to submit the manuscript for publication.

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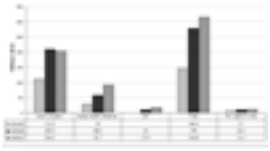
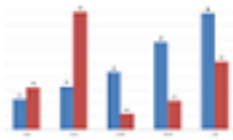

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# Appendix B – Ethics approval (attached in pdf format)

# Appendix C – Tygerberg Hospital approval (attached in pdf format)

# Appendix C – Data collection tools

**Study Number:**
**Date of Collection: 2015-2017**

| | |
|---|---|
| **1. Demographic data** | |
| Age | |
| Gender | |
| Area | |
| Race | |
| **2. Educational** | |
| School attendance (Y/N)<br>If no, when last in school | |
| Highest Level of Education | |
| Current Grade | |
| **3. Psychiatric Diagnosis** | |
| Admission Diagnosis MDD | |
| Bipolar | |
| Adjustment | |
| Suicide attempt | |
| Self-harm | |
| Discharge Diagnoses | |
| MDD | |
| Bipolar | |
| Adjustment | |
| Self-harm | |
| **4. Medical history** | |
| Infective history (TB, HIV) | |
| Epilepsy or Head injury (specify) | |
| Other medical conditions | |
| **5. Psychiatric history** | |
| First presentation (Y/N) | |
| Past psych history | |
| History of Self Harming (Y/N)<br>History of Trauma<br>Previous Suicide Attempt<br>History of Substances | |
| **6. Family history:** | |
| Maternal age | |
| | |
| Marital status | |
| Educational level | |
| Employment | |
| Pregnancy-planned | |
| -not planned | |
| During Pregnancy- | |
| Use of substances | |
| Use of medication | |
| Depression | |
| Domestic violence | |
| Post-partum | |

| | |
|---|---|
| Mood changes | |
| Substances use | |
| Bonding reported | |
| Positive Psychiatric History | |
| HIV | |
| **7. Stressors** | |
| Bereavement | |
| Other loss ( eg divorce, relational) | |
| Trauma/Abuse | |
| Homeless | |
| Pregnancy | |
| School/academic/ bullying | |
| Financial | |
| **8. Forensic History (Y/N)** | |
| **9. Social History** | |
| Known to Social Services (y/n) | |
| Currently Homeless<br>Currently in Place of Safety/Children's Home | |
| Living with parents<br>Living with Foster Family | |